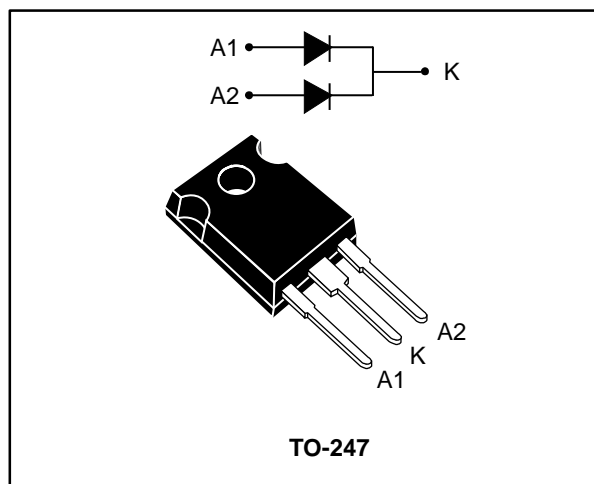


## Automotive 650 V power Schottky silicon carbide diode

Datasheet - production data


**Description**

The SiC diode is a high voltage power Schottky diode. It is manufactured using a silicon carbide substrate. The wide band gap material allows the design of a Schottky diode structure with a 650 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimal capacitive turn-off behavior is independent of temperature.

Used as a freewheeling or output rectification diode, this rectifier will enhance the performance and form factor of the targeted power supply or inverter.

**Table 1: Device summary**

Symbol	Value
$I_{F(AV)}$	2 x 20 A
$V_{RRM}$	650 V
$T_j$ (max.)	175 °C
$V_F$ (typ.)	1.30 V

**Features**

- No reverse recovery charge in application current range
- Switching behavior independent of temperature
- Dedicated to PFC applications
- AEC-Q101 qualified
- PPAP capable
- ECOPACK®2 compliant component

# 1 Characteristics

**Table 2: Absolute ratings (limiting values, per diode, at 25 °C, unless otherwise specified)**

Symbol	Parameter		Value	Unit
V <sub>RRM</sub>	Repetitive peak reverse voltage (T <sub>j</sub> = -40 °C to +175 °C)		650	V
I <sub>F(RMS)</sub>	Forward rms current		40	A
I <sub>F(AV)</sub>	Average forward current	T <sub>c</sub> = 140 °C <sup>(1)</sup> , DC, per diode	20	A
		T <sub>c</sub> = 130 °C <sup>(1)</sup> , DC, per device	40	
I <sub>FRM</sub>	Repetitive peak forward current	T <sub>c</sub> = 140 °C, T <sub>j</sub> = 175 °C, δ = 0.1	87	A
I <sub>FSM</sub>	Surge non repetitive forward current	t <sub>p</sub> = 10 ms sinusoidal, T <sub>c</sub> = 25 °C	90	A
		t <sub>p</sub> = 10 ms sinusoidal, T <sub>c</sub> = 125 °C	70	
		t <sub>p</sub> = 10 μs square, T <sub>c</sub> = 25 °C	400	
T <sub>stg</sub>	Storage temperature range		-55 to +175	°C
T <sub>j</sub>	Operating junction temperature <sup>(2)</sup>		-40 to +175	°C

**Notes:**

<sup>(1)</sup>Value based on R<sub>th(j-c)</sub> max.

<sup>(2)</sup>(dP<sub>tot</sub>/dT<sub>j</sub>) < (1/R<sub>th(j-a)</sub>) condition to avoid thermal runaway for a diode on its own heatsink.

**Table 3: Thermal parameters**

Symbol	Parameter		Value	Unit
R <sub>th(j-c)</sub>	Junction to case	Per diode	0.90	°C/W
		Total	0.60	
R <sub>th(c)</sub>	Coupling		0.30	

**Table 4: Static electrical characteristics (per diode)**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I <sub>R</sub> <sup>(1)</sup>	Reverse leakage current	T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>	-	30	300	μA
		T <sub>j</sub> = 150 °C		-	280	2000	
		T <sub>j</sub> = 25 °C	V <sub>R</sub> = 600 V		15	150	
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drop	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 20 A	-	1.30	1.45	V
		T <sub>j</sub> = 150 °C		-	1.45	1.65	
		T <sub>j</sub> = 175 °C		-	1.50		

**Notes:**

<sup>(1)</sup>Pulse test: t<sub>p</sub> = 5 ms, δ < 2%

<sup>(2)</sup>Pulse test: t<sub>p</sub> = 500 μs, δ < 2%

To evaluate the conduction losses use the following equation:

$$P = 1.02 \times I_{F(AV)} + 0.039 \times I_{F(RMS)}^2$$

Table 5: Dynamic electrical characteristics (per diode)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$Q_{Cj}^{(1)}$	Total capacitive charge	$V_R = 400 \text{ V}$	-	62	-	nC
$C_j$	Total capacitance	$V_R = 0 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	-	1250	-	pF
		$V_R = 400 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	-	100	-	

**Notes:**

<sup>(1)</sup>Most accurate value for the capacitive charge:  $Q_{Cj} = \int_0^{V_{OUT}} C_j(V_R) \cdot dV_R$

# 1.1 Characteristics (curves)

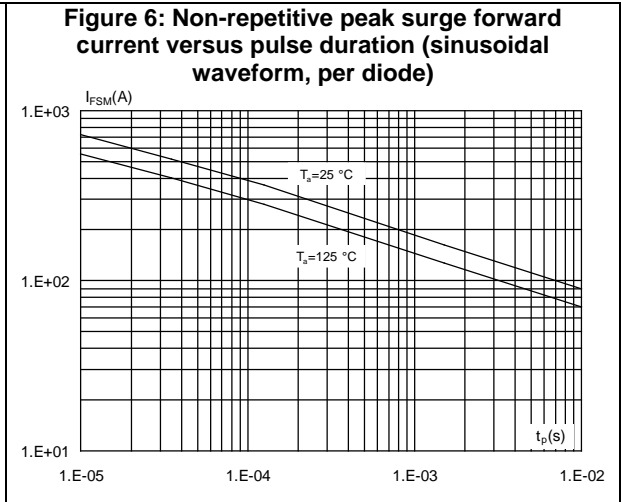
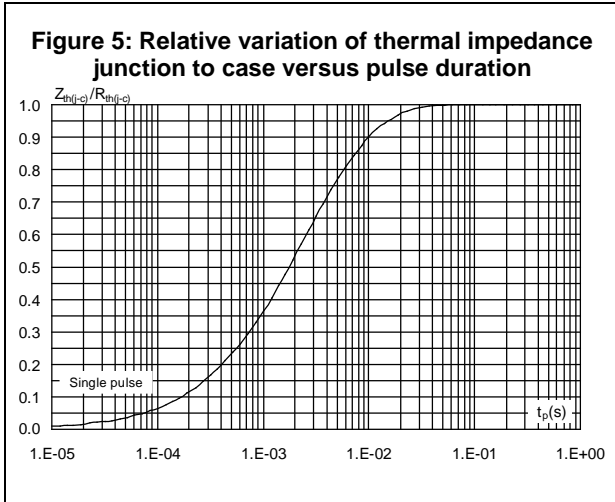
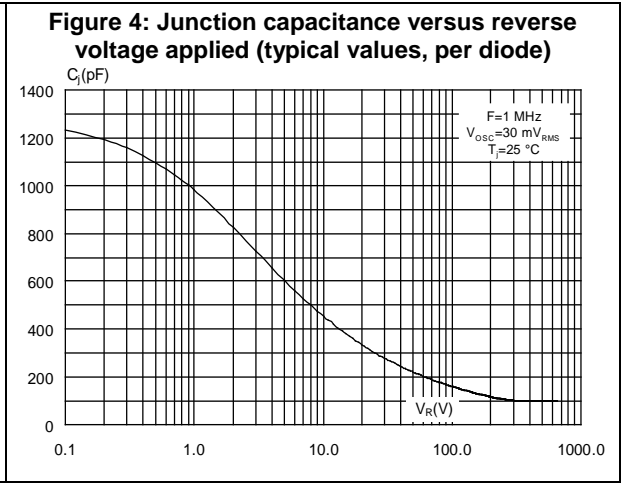
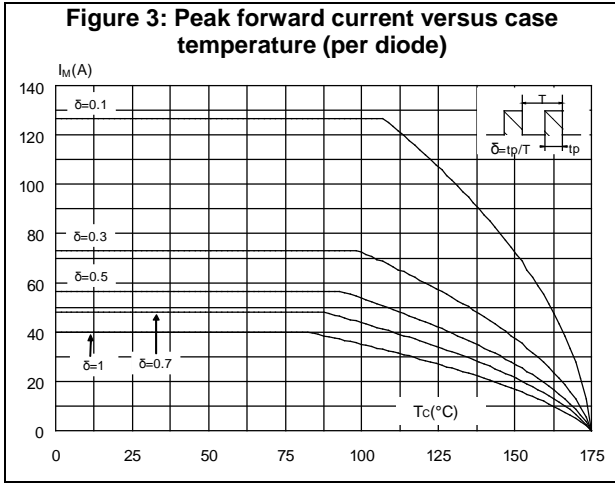
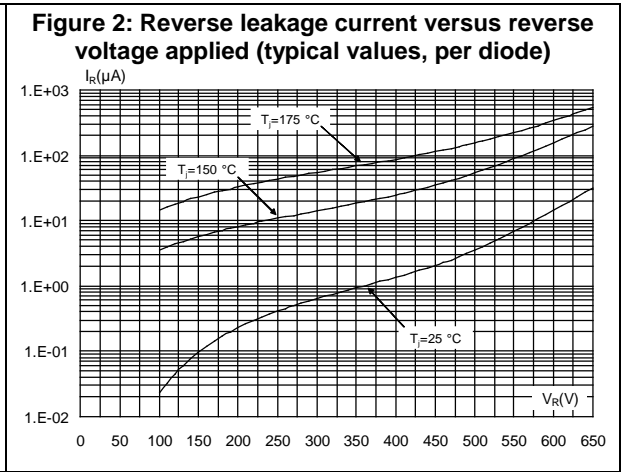
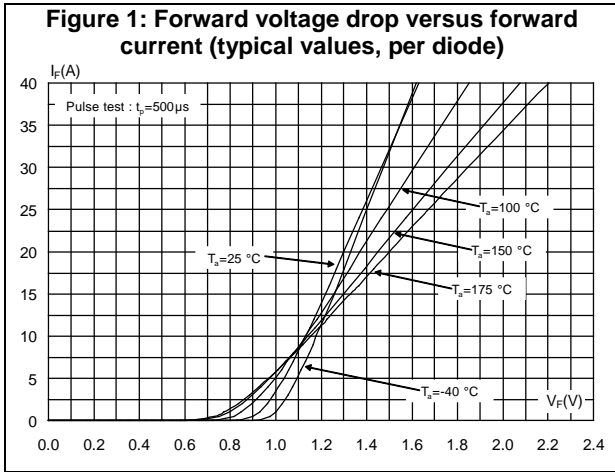
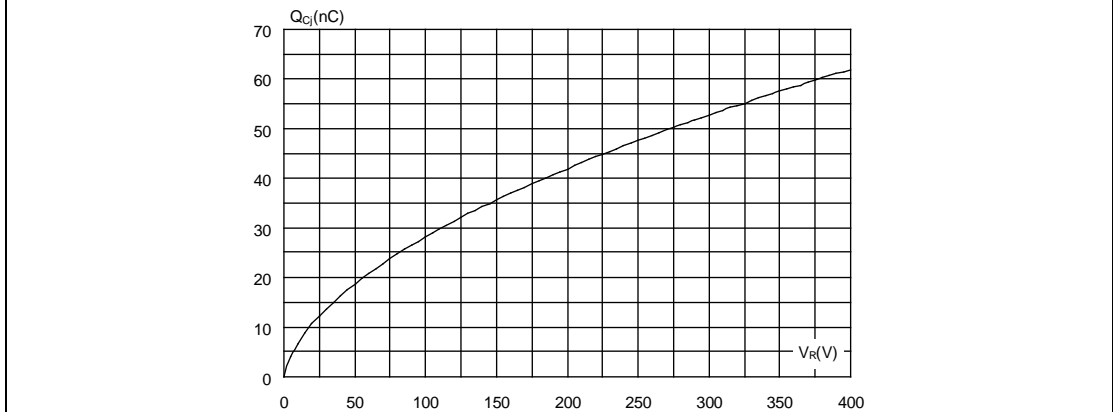


Figure 7: Total capacitive charges versus reverse voltage applied (typical values, per diode)



## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

- Epoxy meets UL 94,V0
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1 N·m

### 2.1 TO-247 package information

Figure 8: TO-247 package outline

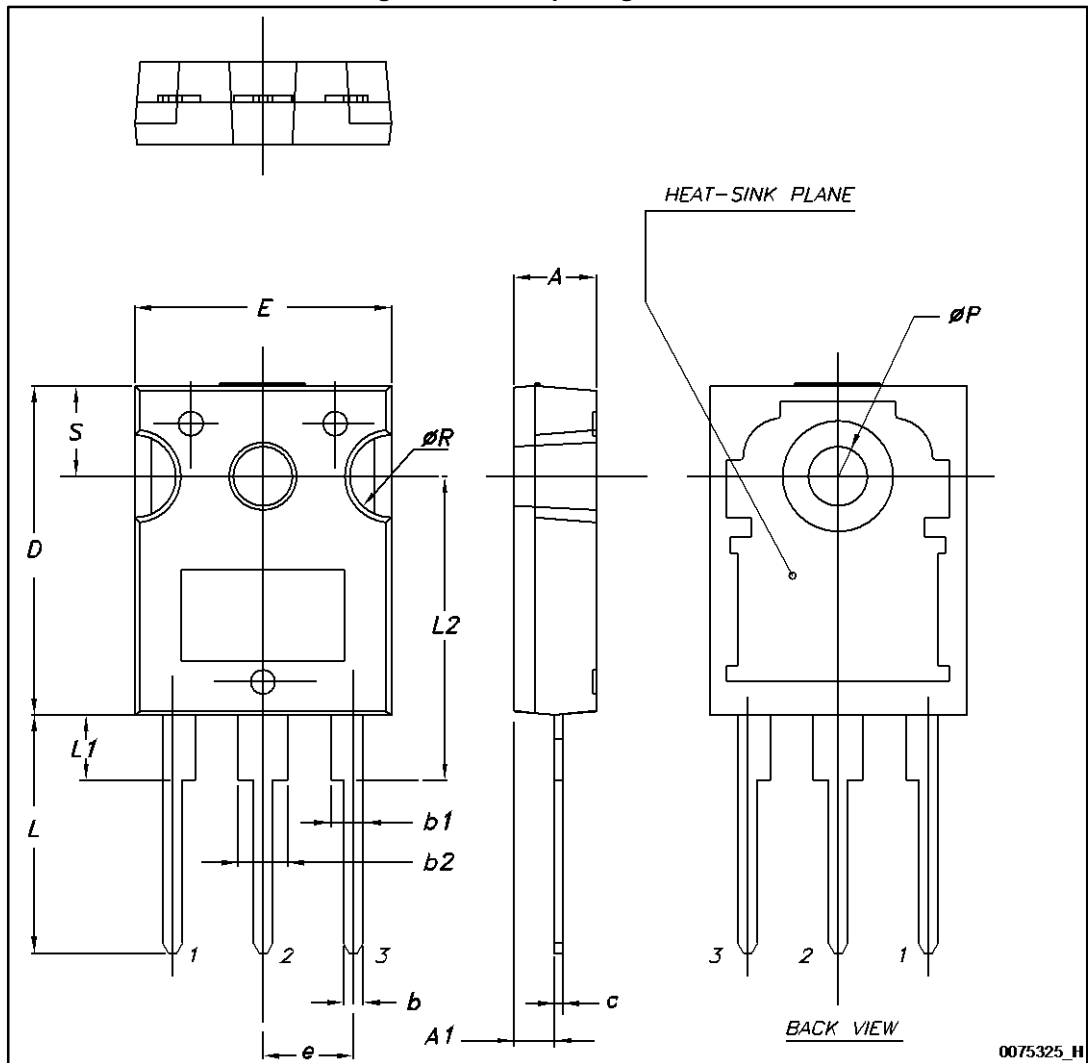


Table 6: TO-247 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.191		0.203
A1	2.20		2.60	0.086		0.102
b	1.00		1.40	0.039		0.055
b1	2.00		2.40	0.078		0.094
b2	3.00		3.40	0.118		0.133
c	0.40		0.80	0.015		0.031
D <sup>(1)</sup>	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e	5.30	5.45	5.60	0.209	0.215	0.220
L	14.20		14.80	0.559		0.582
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
ØP <sup>(2)</sup>	3.55		3.65	0.139		0.143
ØR	4.50		5.50	0.177		0.217
S	5.30	5.50	5.70	0.209	0.216	0.224

**Notes:**

<sup>(1)</sup>Dimension D plus gate protusion does not exceed 20.5 mm

<sup>(2)</sup>Resin thickness around the mounting hole is not less than 0.9 mm.

### 3 Ordering information

Table 7: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC40065CWY	PSC40065CWY	TO-247	4.43 g	30	Tube

### 4 Revision history

Table 8: Document revision history

Date	Revision	Changes
11-May-2016	1	First issue.
12-May-2016	2	Updated cover page footnote.



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